Daniel J. Rohlf, OSB 990069
rohlf@lclark.edu
Telephone: (503) 768-6707
Thomas Buchele, OSB 081560
tbuchele@lclark.edu
Telephone (503) 768-6736
Earthrise Law Center
10015 S.W. Terwilliger Blvd.
Portland, OR 97219-7768

Attorneys for Plaintiffs

UNITED STATES DISTRICT COURT
DISTRICT OF OREGON

AUDUBON SOCIETY OF PORTLAND, WILDLIFE CENTER OF THE NORTH COAST, ANIMAL LEGAL DEFENSE FUND, CENTER FOR BIOLOGICAL DIVERSITY, FRIENDS OF ANIMALS, Plaintiffs, v. U.S. ARMY CORPS OF ENGINEERS, U.S. FISH AND WILDLIFE SERVICE, USDA WILDLIFE SERVICES, Defendants.	Civil No. 15-665 **DECLARATION OF LINDA R. WIRES**

I, Linda R. Wires, declare as follows:

1. I, Linda R. Wires am a resident of Minneapolis, Minnesota.

2. I am a Conservation Biologist and have specialized on issues affecting waterbirds for the last 18 years. The Double-crested Cormorant has been a focal species for me and I have studied and monitored these birds at their colonies in the U.S. Great Lakes and Minnesota since the late1990s. I have authored numerous peer-reviewed

publications and reports on cormorants, and I was the lead author of the continental status assessment for Double-crested Cormorants, prepared under contract with the U.S. Fish and Wildlife Service in 2001. I am recognized as an authority on this species and I have given presentations across North America and internationally to address various topics related to cormorants, especially management. In 2014 I authored a book that outlines the history, biology and politics of cormorants, titled *The Double-crested Cormorant, Plight of a Feathered Pariah*, published by Yale University Press.

3. Attachment #1includes my Curriculum Vitae, which highlights my extensive professional and academic experience which demonstrates my position as a leading expert in the study of Double-crested Cormorants.

4. I currently work under contract for the U.S. Fish and Wildlife Service coordinating a large-scale waterbird habitat monitoring and management effort. The comments submitted here are not written on behalf of this agency and represent entirely my own personal viewpoints. However, they are based on years of experience monitoring and studying cormorants and other fish-eating birds, and a detailed understanding of pressures on federal and state agencies to manage fish-eating birds. In addition, I have commented on all of the management proposals that have developed for cormorants since 2001, including the one for the colony on East Sand Island, Oregon, and I have a thorough understanding of cormorant management policy.

5. I am familiar with the issues surrounding DCCOs in western North America. To gain a broader understanding of issues specifically in the Columbia River estuary and help provide informed comments on the USACE DEIS, I also visited the East Sand Island (ESI) colony in July of 2014. During this visit I was able to spend time at the

colony and also interact with many of the biologists, managers, and resource professionals involved in this issue. After reviewing the available science surrounding the conflict at ESI, and spending some time at the site, I prepared detailed comments, attachment #2, strongly encouraging the USACE to pursue a less aggressive, nonlethal approach to resolving conflicts with cormorants. I indicated Alternative C (the Preferred Alternative) was inappropriate for several reasons. Below, I have provided a very abbreviated synopsis of my concerns and comments submitted to the USACE in lieu of their proposed action.

6. The population target for cormorants was based on a NOAA Fisheries' "survival gap" analysis that was not peer-reviewed nor scientifically rigorous enough to inspire confidence and demonstrate that the chosen population target is appropriate. Of course, the sole reason to attempt to reduce cormorant predation on listed juvenile salmon and steelhead is to increase the number of adult salmon and steelhead that return to their native rivers and streams to spawn. However, reducing cormorant numbers will only result in increased survival rates of salmon if the impact of their predation is additive, rather than compensatory, i.e., if the juvenile fish eaten by cormorants would otherwise have survived and returned to spawn. Whether predation from cormorants is having a compensatory or additive effect is fundamental to the argument that control of cormorants is warranted, but one which this analysis has not seriously evaluated. Out-migrating smolts must go on to survive the ocean phase of their life cycle before returning to spawn…a phase in which they will encounter myriad predators and other mortality factors. Additionally, smolts that die due to cormorant predation may be less fit than fish that die due to dams (e.g., turbine passage). Therefore, it is entirely possible that

some portion of the mortality due to cormorants may be completely meaningless. The assumption that a reduction in cormorant numbers will result in an equal increase in smolts surviving to adulthood is naïve. The idea advanced by the Corps that compensatory mortality is not an important consideration – that reducing the cormorant population to "base period" levels is the key goal of the Corps' management plan – is scientifically indefensible. The Corps has simply not presented any compelling scientific data to bolster the hope that destroying thousands of cormorants and their nests will significantly improve salmon and steelhead runs. Failure to consider the role of compensatory vs additive mortality in a decision to destroy thousands of a federally protected bird species is scientific malpractice.

7. The USFWS is tasked not only with managing migratory birds, but also protecting them. To this end, relative to issuing depredation permits, the agency clearly states that prior to issuing a depredation permit for killing cormorants and destroying eggs and nests, parties requesting the permit must first demonstrate that substantial non-lethal methods such as harassing/hazing, exclusions, habitat management, and cultural practices have been implemented and did not work. Not only has this not happened, there is also substantial evidence to suggest that nonlethal methods, if employed at the appropriate scale and intensity, are entirely feasible in reducing cormorant consumption of salmonid smolts in the Columbia River estuary.

8. Experience with lethal operations in Eastern North America indicates that much greater levels of destruction must be employed than just the difference between current and targeted colony size. Specifically, several examples from the Great Lakes basin have demonstrated that the number of birds killed that was necessary to reach and

maintain population targets greatly exceeded the difference between starting and target population sizes. Typically, initiation of this type of activity necessitates long-term and repeated culling programs to maintain objectives.

9. I have great concern about the impacts to the western population of Double-crested Cormorants that could result from the proposed actions. Reducing the cormorant population through lethal means by the magnitude proposed has implications for the entire western North American population of DCCOs. The ESI colony constitutes more than 40% of the western population (Roby et al. 2014). The EIS implies that this reduction will not negatively impact the population because the western population was sustainable at 1990 levels (p. 14). However, it is not clear that the population was sustainable at 1990 levels (particularly since the population has been in a recovery mode during most of the 20th and 21st centuries). In fact, a review that examined the status of DCCOs in western North America (Carter et al. 1995) documented various conservation problems that existed for DCCOs in the 1990s. This paper indicated that while cormorants were recovering in this region from losses experienced in the 19th century, local declines were still occurring due to habitat loss, pollution, human disturbance, and predators. Moreover, Carter et al. (1995) indicated that increases in numbers of nesting cormorants in the Columbia River Estuary coincided with declines in British Columbia, Washington, and locations in interior Oregon. Thus it is not clear that the 1990s population was sustainable, at least not without a large and productive colony on East Sand Island. Furthermore, since the 1990s, declines have occurred at both coastal and other inland regions have occurred (Adkins et al. 2014; W.D. Shuford, pers. comm.), and these are not considered in the DEIS. Elimination of the number of birds specified in the

Corps' management plan runs a significant risk of having detrimental impacts on the entire western population. Further, I believe that the EIS has understated both how many birds will need to be taken and the risk to the western population from a cull of such magnitude.

10. I have great concern that management at this scale could lead to colony abandonment or reproduction failure. The Corp is proposing management of massive scale on the island and the cumulative effect of the human disturbance proposed to take place on the colony is of real concern. It is my view that this disturbance on the colony raises significant risk that the entire colony could be abandoned or that reproduction levels could drop to zero. Though the Corp plans to monitor the health and reproduction levels of the colony during their population control actions, and adjust its actions accordingly to ensure it reaches its stated population goals; any potential adjustment of this management could prove to be too late as the nature of colony abandonment could be immediate and thus unable to be mitigated.

11. I have great concern about potential impacts that management at this scale could have on other birds nesting or roosting on East Sand Island. As noted above, I have visited this colony and nesting Brandt's cormorants are closely inter-mixed with nesting double-crested cormorants. I think it will be impossible to avoid accidentally shooting many Brandt's cormorants while shooting up to 11,000 DCCOs.

12. I have great concern about the stability of the colony and potential for abandonment due to the culling and management operations. Experience in the eastern U.S. with cormorant culling operations indicates that even with experienced sharp shooters, such as Wildlife Services personnel, clean shots are not always made, and

shooting from shotguns at birds in flight frequently results in birds being wounded, but not killed. Typically efforts are made to retrieve wounded birds and immediately euthanize them. However, I am not sure how this would happen on ESI without causing major and repeated disturbances. Further, if shooting takes place at night from blinds and tunnels, I again don't know how injured birds would be easily retrieved in the dark. Trying to retrieve wounded cormorants during daylight would certainly cause enormous disturbance to nesting birds, which could lead to colony abandonment, as could walking through the colony picking up dead bodies. Furthermore, the colony has a large gull presence. Gulls are highly opportunistic predators and will take every opportunity to feed on eggs and chicks when parent birds fly off the nest. Cormorants will be one of the first birds to fly off the nests when Wildlife Services personnel approach and enter the colony to oil eggs or retrieve birds. In my own personal experience on Great Lakes islands, I and colleagues have seen as much as 80-90% of a colony's reproductive effort eliminated directly as a result of gull predation on nest contents facilitated by human entry to a colony (F.J. Cuthbert and L.R. Wires, unpublished data). This is especially the case with ground nesting birds. This is such a significant issue that we modified many of our monitoring activities at colonies shared with gulls. For instance, we did our cormorant banding at night when gulls weren't typically foraging, though at some colonies the gulls even learned that they could forage at night and became a problem. We also did aerial photography at our ground nesting colonies as much as possible to avoid facilitating gull predation. Work on Lake Champlain by Duerr et al. (2007) documents that when gulls depredated cormorant eggs at high rates during egg oiling, dispersal from the colony increased significantly.

12. In closing, it is my professional opinion that the proposed plan will lead to cormorants and potentially many other birds simply becoming additional casualties, along with the array of salmonids, of the already highly mismanaged Columbia River ecosystem. One of the most important conclusions from my book (Wires 2014) is that most cormorant management either is not science-based, is based on poor-quality science, or is contrary to what scientific studies indicate. Based on my observations and concerns described above, the same conclusion emerges for the management alternative advocated by the USACE and cooperating agencies for the Columbia River Estuary. East of the Mississippi the establishment of depredation orders for double-crested cormorants has resulted in a 19th century approach to cormorant management. A model of killing as the approach to cormorant management has become entrenched, and a pattern of destroying cormorants in huge numbers once again prevails. This is just what we do with cormorants, especially relative to fisheries with a long history of poor management…despite the irrationality that underlies this approach. I hope the courts will intervene so that this irrational approach is not applied west of the continental divide to an already compromised population of double-crested cormorants.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on April 27, 2015.

Linda R. Wires

Literature cited

Adkins, J. Y., D. D. Roby, D. E. Lyons, K. N. Courtot, K. Collis, H. R. Carter, W. D. Shuford, and P. J. Capitolo. 2014. Recent population size, trends, and limiting factors for the double-crested cormorant in western North America. Journal of Wildlife Management 78:000-000; doi: 10.1002/jwmg.737

Carter, H. R., A. L. Sowls, M. S. Rodway, U. W. Wilson, R. W. Lowe, G. J. McChesney, F. Gress, and D. W. Anderson. 1995. Population size, trends, and conservation problems of the double-crested cormorant on the Pacific coast of North America. Colonial Waterbirds 18:189–215.

Duerr, A. E., Donovan, T. M. And Capen, D. E. (2007), Management-Induced Reproductive Failure and Breeding Dispersal in Double-Crested Cormorants on Lake Champlain. The Journal of Wildlife Management, 71: 2565–2574. doi: 10.2193/2006-527

Lyons, D.E., D.D. Roby, A.F. Evans, N.J. Hostetter, K. Collis, and S.H. Sebring. 2014. Benefits to Columbia River anadromous salmonids from potential reductions in predation by double-crested cormorants nesting at the East Sand Island colony. Final Report to the U.S. Army Corps of Engineers – Portland District. U.S. Army Corps of Engineers, Portland, OR. 50 pp. (Available through internet: www.birdresearchnw.org)

Roby, D.D., K. Collis, D.E. Lyons, J.Y. Adkins, Y. Suzuki, P. Loschl, T. Lawes, K. Bixler, A. Peck-Richardson, A. Patterson, S. Collar, A. Piggott, H. Davis, J. Mannas, A. Laws, J. Mulligan, K. Young, P. Kostka, N. Banet, E. Schniedermeyer, A. Wilson, A. Mohoric, A. Evans, B. Cramer, M. Hawbecker, N. Hostetter, A. Turecek, J. Zamon, and D. Kuligowski. 2014. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Draft 2013 Annual Report to the U.S. Army Corps of Engineers and the Bonneville Power Administration, Portland, OR. 237 pp. (Available through internet: www.birdresearchnw.org)

Wires, L. R. 2014. The Double-crested Cormorant, plight of a feathered pariah. Yale University Press, New Haven, Connecticut. 349 pp.

CURRICULUM VITAE

Wires, Linda Ruth
3352 34th Ave. S., Minneapolis, MN 55406
Cell: 612-590-4007; Ofc: 612-624-2297
E-mail: wires001@umn.edu

Education

M.S., University of Minnesota, Conservation Biology Program, December 1995

M.A., University of Chicago, Department of English Language and Literature, August 1989

B.A., University of Illinois at Chicago, Department of English, June 1987

Professional and Academic Experience

Project Coordinator, Integrated Waterbird Management and Monitoring. US fish and Wildlife Service, Bloomington, MN. Dec 2013-Present. Coordinate and manage all aspects of national monitoring and habitat management program (Integrated Waterbird Management and Monitoring) focused on nonbreeding waterbirds during migration and winter.

Research Fellow, Dept. of Fisheries, Wildlife and Conservation Biology, U of M, St. Paul, MN, 09/1996 – June 30, 2013. All aspects of research, monitoring and conservation of waterbirds in the U.S. Great Lakes and Minnesota.

Biological Consultant. 2000-2013. Various agencies and non-governmental organizations in U.S. and Canada. Multiple waterbird and island ecosystem projects.

Curatorial Assistant, Mammalogy Collection, Bell Museum of Natural History / U of M, St. Paul, MN. 1994-1995. Management of mammal collection specimens and database.

Teaching Assistant, U of M, General Biology and Ecology, Evolution and Behavior programs, 1990 –1995. Lab sections of Biology, Ecology and Zoology.

Books

Wires, L.R. 2014. The Double-crested Cormorant: Plight of a Feathered Pariah. Yale University Press, New Haven, CT.

Peer-reviewed Publications

Morris, R.D., D.V. Weseloh, L.R. Wires, C.Pekarik, F.J. Cuthbert, and D.J Moore. 2011. Population trends of Ring-billed Gulls breeding on the North American Great Lakes, 1976-2009. Waterbirds. 34:202-212.

Wires, L.R. and F.J. Cuthbert. 2010. Characteristics of Double-crested Cormorant Colonies in the U.S. Great Lakes Island-Landscape. 2010. Journal of Great Lakes Research, 36(2):232-241.

Morris, R.D., D.V. Weseloh, F.J. Cuthbert, C.Pekarik, L.R. Wires and L.Harper. 2010 Distribution and abundance of nesting common and Caspian terns on the North American Great Lakes, 1976 to 1999. J. Great Lakes Research 36: 44-56.

Wires, L.R. and F.J. Cuthbert. 2006. Historic populations of the Double-crested Cormorant (*Phalacrocorax auritus*): Implications for conservation and management in the 21st century. Waterbirds 29:9-37.

Wires, L.R., K.V. Haws, F.J. Cuthbert, N. Drilling, and A.C. Smith. 2006. The Double-crested Cormorant and American White Pelican in Minnesota: First statewide breeding census. The Loon 78:63-73.

Wires, L. R., Carss, D. N., Cuthbert, F.J & Hatch, J. J. 2003. Transcontinental Connections in Relation to Cormorant-fisheries Conflicts: Perceptions and Realities of a "Bete Noire" (Black Beast) on Both Sides of the Atlantic. Vogelwelt 124 (Supplement "Cormorants: Ecology and Management, Procs. of the 5th Intl. Conference on Cormorants"): 389-400.

Cuthbert, F. J., L.R. Wires and J. McKearnan. 2002. Potential Impacts of Nesting Double-Crested Cormorants (*Phalacrocorax Auritus*) on Colonial Waterbirds in the Great Lakes Region. Cormorant Research Special Edition, Journal of Great Lakes Research 28 (2), International Association of Great Lakes Research.

Wires, L.R., F.J. Cuthbert, D.V. Weseloh and D.R. Trexel. 2000 The Double-crested Cormorant in Eastern and Central North America: A Summary of Status and Research. Wetlands International Cormorant Research Group Bulletin 4:5-9.

Wires, L.R. and F.J. Cuthbert. 2000. Trends in Caspian Tern Numbers and Distribution in North America: A Review. Waterbirds 23: 388-404.

Cuthbert, F.J. and L.R. Wires. 1999. Caspian Tern (*Sterna caspia*). *In* The Birds of North America, No. 403 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Major Technical Reports or Symposium Publications

Wires, L.R., F.J. Cuthbert and T. Arnold. 2013. The American White Pelican in Minnesota after the Deepwater Horizon Oil Spill: Assessing Distribution, Abundance and Population change. Final Report (June 2013) to Minnesota Department of Natural Resources, St. Paul, MN.

Wires, L.R., F.J. Cuthbert and T. Arnold. 2013. Advancing Great Lakes Colonial Waterbird Monitoring Priorities: Sampling and Collaboration. Final Report (June 2013) to US Fish and Wildlife Service, Ft. Snelling, MN.

Cuthbert, F.J. and L.R. Wires. 2013. The fourth decadal U.S. Great Lakes colonial waterbird survey (2007-2010): Results and recommendations to improve the scientific basis for

conservation and management. Final Report (February 2013) to US Fish and Wildlife Service, Region 3, Ft. Snelling, MN.

Wires, L.R., F.J. Cuthbert, and M. Girsch. 2012. Surveys for Nesting Colonial Waterbirds at Lake Waconia and Pigeon Lake, MN, 2012. Final Report Submitted to Minnesota Department of Natural Resources, Nongame Wildlife Program. St. Paul, MN.

Wires, L.R., F.J. Cuthbert, and D.C. Hamilton. 2011. The American White Pelican and Double-crested Cormorant in Minnesota in 2010: Distribution, abundance and population change. Final Report to MN Dept. Nat. Res. State Wildlife Grants Program.

Cuthbert, F.J., J. McKearnan, L.R. Wires, and A. Joshi. 2010. The Third Decadal Great Lakes Colonial Waterbird Survey: Distribution and abundance of colonial waterbirds in the US Great Lakes 1997-1999. Final Report to US Fish and Wildlife Service, Ft. Snelling, MN.

Wires, L.R., S. J. Lewis, G. J. Soulliere, S. W. Matteson, D. V. "Chip" Weseloh, R. P. Russell, and F. J. Cuthbert. 2010. Upper Mississippi Valley / Great Lakes Waterbird Conservation Plan. A plan associated with the Waterbird Conservation for the Americas Initiative. Final Report submitted to the U. S. Fish and Wildlife Service, Fort Snelling, MN. xx pp.

Vigmostad, K.E., F. Cuthbert, D. Ewert, D. Kraus, M. Seymour, and L. Wires. 2007. Great Lakes Islands: Biodiversity Elements and Threats. Final Report to the Great Lakes National Program Office of the Environmental Protection Agency.

Wires, L.R., K.V. Haws and F.J. Cuthbert. 2005. The Double-crested Cormorant and American White Pelican in Minnesota: a statewide status assessment. Final Report to Minnesota Department of Natural Resources' Statewide Wildlife Grants Program. Nov 2005. Bemidji, MN.

Wires, L.R. and F.J. Cuthbert. Minnesota Fish Producers Report on Losses to Birds. 2004. Fact Sheet summarized from Wires and Cuthbert 2003, Minnesota SeaGrant. 4 p.

Wires, L.R. 2004. Indicators for Area, Quality, and Protection of Great Lakes Islands. Developed for the Binational Collaborative for the Conservation of Great Lakes Islands. October 2004. Northeast-Midwest Institute, Washington, DC.

Wires, L.R. and Cuthbert, F.J. 2003. Fish-eating bird predation at aquaculture facilities in Minnesota: a first step towards bridging the information gap. Final Report to Minnesota Sea Grant. Duluth, MN. http://www.seagrant.umn.edu/downloads/a20.pdf

Cuthbert, F. J., L.R. Wires and K. Timmerman. 2003. Status of the Great Lakes Common Tern Population. USFWS.

Cuthbert, F.J. and L.R. Wires. 2003. Common Terns in Michigan: Development of a Monitoring Program. Final Report to Natural Heritage Small Grants Program, Michigan Department of Natural Resources.

Cuthbert, F.J. and L.R. Wires. 2002. Common Tern Breeding Populations: A Review of Common Tern Band Recovery Data 1922-2000.

Wires, L.R., F.J. Cuthbert, D. Trexel, and A.R. Joshi. 2001. Status assessment of the Double-crested Cormorant in Central and Eastern North America. USFWS.

Wires, L.R., F.J. Cuthbert, D. Trexel, and A. Joshi. 2001. Status of the Double-Crested Cormorant in North America. USFWS Special Publication. http://library.fws.gov/Bird_Publications/cormorant_status01.pdf

Wires, L.R. and F.J. Cuthbert. 2001. Prioritization of waterbird colony sites for conservation in the U.S. Great Lakes: Final Report to U.S. Fish and Wildlife Service. Fort Snelling, MN.

Internet Publications

http://migratorybirds.fws.gov/issues/cormorant/cormorant.html (Status Assessment of the Double-crested Cormorant in North America)

www.waterbirdconservatio.org or http://pwatol.us/mibci/fileadmin/user_upload/ResearchMonitoring/UMVGLWaterbirdPlan5-26-10.pdf (Upper Mississippi Valley / Great Lakes Waterbird Conservation Plan).

Other Publications

Wires, L.R. 2013. Book Review: The Double-crested Cormorant: Symbol of ecological conflict. Waterbirds 36: 108-109.

Research Support (Research funding in which I had a major role in writing proposals, supervising technicians, field work, data analysis and preparation of final report).

- Monitoring Double-crested Cormorants in Minnesota at individual colonies (2011-2013). MN Dept. of Natural Resources.($15,600).
- The American White Pelican in Minnesota: after the Deep Water Horizon spill. (2011-12) LCCMR (MN DNR) ($60,000).
- Advancing Great Lakes Colonial Waterbird Monitoring Priorities, Sampling and Collaboration. (2011, 2012). U.S. Fish and Wildlife Service. ($37,000).
- Estimation of American White Pelican and Double-crested Cormorant populations in Minnesota. (2010) Minnesota Department of Natural Resources ($58,000).
- Monitoring of Colonial Waterbird Populations in the Great Lakes: Improving the Scientific Basis for Conservation and Management. (2007-2010). US Fish and Wildlife Service ($315,000).
- Long-Term Monitoring of Colonial Waterbird Populations in the Great Lakes (2005-2010). US Fish and Wildlife Service ($54,234).
- Estimating Detectability Rates for Colonial Waterbirds in the U.S. Great Lakes (2005-06). U.S. Geological Survey ($22,290).
- The Double-crested Cormorant and American White Pelican in Minnesota: A Statewide Status Assessment. (2004-05). MN DNR. ($60,000).
- Framework for Binational Conservation of Great Lakes Islands. (2003-04) U.S. Environmental Protection Agency (Great Lakes National Program Office), with The Nature Conservancy, Nature Conservancy Canada, Northeast-Midwest Institute). ($200,000).
- Conservation of Waterbirds in the Upper Mississippi Valley and Great Lakes Region. (2003-05) US Fish and Wildlife Service ($66,000).
- Conservation of Great Lakes Colonial Waterbirds (2002-03). US Fish and Wildlife Service ($10,000)
- Fish-eating Bird Predation at Aquaculture Facilities in Minnesota: Bridging the Information Gap (2002). Minnesota Sea Grant ($9,500).
- Common Terns In Michigan: Development Of An Annual Monitoring Effort, 2002. US Fish and Wildlife Service ($7,200); MI DNR ($5,000).
- Double-crested Cormorant Status Assessment and Biodiversity Impacts (2000-02) US

Fish and Wildlife Service ($118,000).
- Status Assessment of Double-crested Cormorants in North America (1998-2000), US Fish and Wildlife Service $35,000.

Scientific Presentations *(selected)*

Wires, L.R. The Double-crested Cormorant: Plight of a Feathered Pariah. Minnesota Ornithological Union, Minneapolis, MN, Dec 2014; Tommy Thompson Park, International Migratory Bird Day / Spring Bird Festival, Toronto, ON, Canada, May 2014.

Wires, L.R. 2014. Cormorant-fisheries conflicts: an evaluation of management policy. Waterbird Soceity, La Paz, Baja California, MX. Nov 2014.

Tavernia, B., L.R. Wires, J. Stanton, J. Lyons, M.T. Jones, P. Heglund, J. Coppen, M. Knutson, B. Loges, E. Lonsdorf, S. Jacobi, W. Thogmartin, M. Runge, B. Thompson. Integrated Waterbird Management and Monitoring. (Presenter L. Wires). Waterbird Soceity, La Paz, Baja California, MX, Nov 2014.

Cuthbert, F.J., L. Wires, D.V. Weseloh and D. Moore. Lansing, MI. 2013 (Presenter: Cuthbert). Great Lakes Cormorant Working Group Meeting, Estimating Double-crested Cormorant population size and trends using a sampling approach.

Cuthbert, F.J., L. Wires, D.V. Weseloh and D. Moore. Sault Ste. Marie, MI. 2012. (Presenter: Cuthbert). Western Great Lakes Waterbird Meeting, Censusing priority waterbird colony sites: new approach to obtaining estimates and trends.

Wires, L.R. and Cuthbert, F.J. Nov 2011. (Presenter: Wires). Monitoring colonial waterbirds in the U.S. Great Lakes: A new approach to an old survey. Waterbird Society. Annapolis, MD. November 2011.

Wires, L.R., F.J. Cuthbert, D.C. Hamilton and T. Arnold. Mar 2011. (Presenter Wires). Evaluation of Aerial Photography to Estimate Colony Sizes of Double-crested Cormorants in the Upper Mississippi Valley / Great Lakes Region. 34th Annual Meeting of the Waterbird Society. Grand Island, NE.

Wires, L.R., F.J. Cuthbert, K.V. Haws, and D.C. Hamilton. 2010. (Presenter: Wires). The American White Pelican & Double-crested Cormorant in Minnesota: Assessing distribution, abundance and population change, 2004-2010. Minnesota Ornithological Union Annual Meeting.

Wires, L.R. and F.J. Cuthbert. 2007. (Presenter: Wires). Characterizing Double-crested Cormorant colony sites in the US Great Lakes: from island to landscape. 31st Annual Meeting of the Waterbird Society. Barcelona, Spain.

Wires, L.R. 2007. (Presenter: Wires). Evaluating the impacts of an exceptional avian predator on Great Lakes fishes: the Double-crested Cormorant. Cormorant Defenders International, Symposium on Double-crested Cormorants: Sorting facts from the "fishy" myths about their impact on the Great Lakes ecosystem. Toronto, ON (Invited).

Wires, L.R. and F.J. Cuthbert. 2006. (Presenter: Wires). Management policies for Double-crested Cormorants: a new threat to fish-eating birds. 4th North American Ornithological Conference, American Bird Conservancy / Partners in Flight Conservation Symposium. Veracruz, Mexico (Invited).

Wires, L.R and F.J. Cuthbert. 2004. (Presenter: Wires). Natural wetland use by fish-eating birds and aquaculture in Minnesota: Context for controversy. Society for Conservation

Biology, Annual Meeting, New York, New York; American Ornithologists' Union, Annual Meeting, Quebec City, Quebec, Can.

Wires, L.R. and F.J. Cuthbert. 2002. (Presenter: Wires). Biology and politics of the Double-Crested Cormorant in North America: Implications for conservation and management of fish-eating birds. American Bird Conservancy Policy Meeting. Washington, DC. (Invited).

Wires, L.R., F.J. Cuthbert and D.R. Trexel. 2001. (Presenter: Wires). Assessing impact of Double-Crested Cormorants on fish resources in North America: Review of population trends and diet studies; implications for management. International Symposium and Workshop on Interaction between fish and birds: implications for management. Hull, UK.

Wires, L.R., D.N. Carss and F.J. Cuthbert. 2000. (Presenter: Wires). Transcontinental connections: Cormorant-fisheries conflicts, perceptions and realities on both sides of the Atlantic. 5th International Conference on Cormorants and 2nd Meeting of Wetlands International Cormorant Research Group. Freising, Germany.

Wires, L.R., F.J. Cuthbert and D.R. Trexel. 2000. (Presenter: Wires). Distribution of the Double-crested Cormorant in North America: Perceptions of population recovery. Waterbird Society Annual Meeting, Plymouth, MA.

Wires, L.R., F.J. Cuthbert and D.R. Trexel. 2000. (Presenter: Wires). Double-crested Cormorant historic trends in North America. American Ornithologists' Union. St. Johns, NL.

Wires, L.R. and F.J. Cuthbert. 1999. (Presenter: Wires). Status assessment of the Double-crested Cormorant in North America. Waterbird Society Meeting, Grado, Italy (Invited).

Symposia/Workshop Convenor or Participant

Development of a Long-term Monitoring Strategy for a Binational Great Lakes Colonial Waterbird Survey: Workshop. Waterbird Society Meeting, LaCrosse, WI, November 2002 (Co-organizer and convenor with F. Cuthbert).

Double-crested Cormorant-Fishery Conflict Workshop, Plymouth, MA Nov. 2000 (Co-organizer with F. Cuthbert).

Scientific Societies

Waterbird Society, Member 1999-2013; Council 2007-2010; Student Awards Committee Chair, 2004-2011; Associate Editor 2006-present.

Professional Journal Reviews

Biological Conservation, Condor, Ecological Applications, Estuarine, Coastal and Shelf Science, Human Wildlife Conflicts, Journal of Applied Ecology, Journal of Field Ornithology, Journal of Great Lakes Research, Journal of Wildlife Management, Wilson Bulletin, Northeastern Naturalist, Southeast Naturalist, Waterbirds.

Computer Skills

MS Word, Excel, Powerpoint; Limited experience using MS Access, ArcMap GIS and Google Earth.

COMMENTS ON:
Public Notice number CENWP-PM-E-14-08
USACE Draft Environmental Impact Statement
To Reduce Double-crested Cormorant Predation of Juvenile Salmonids in the Columbia River Estuary,
June 19, 2014.

Submitted by:
Linda R. Wires, MS & MA
Conservation Biologist
Minneapolis, MN

These comments respond to the U.S. Army Corps of Engineers (USACE), Portland District, Double-crested Cormorant management plan to reduce predation of juvenile salmonids in the Columbia River Estuary.

I have been monitoring the status and distribution of cormorants in eastern North America since 1998. I was the lead author of the 2001 North American Double-crested Cormorant Status Assessment completed under contract with the USFWS. I have also reviewed and commented on all of the Environmental Assessments and Environmental Impact Statements for DCCO management that have been developed since 2003. In 2014, I published a book on Double-crested Cormorants (hereafter DCCO) entitled, *The Double-Crested Cormorant, Plight of a Feathered Pariah*. This work included detailed reviews of the science underlying assessment of fisheries impacts from DCCOs, and management of this species under the two depredation orders in states east of the Mississippi River. Although most of my work with cormorants has been in the eastern U.S., I am familiar with the issues surrounding DCCOs in western North America. To gain a broader understanding of issues specifically in the Columbia River estuary and help provide informed comments on the USACE DEIS, I also visited the East Sand Island (ESI) colony in July of 2014. During this visit I was able to spend time at the colony and also interact with many of the biologists, managers, and resource professionals involved in this issue.

After reviewing the available science surrounding the conflict at ESI, and spending some time at the site, I am writing to strongly encourage the USACE to pursue a less aggressive, nonlethal approach to resolving conflicts with cormorants. I believe Alternative C (the Preferred Alternative) is inappropriate for several reasons, which are described below.

1. **"Survival gap" analysis and population objective for cormorants**. The population objective of ~ 5,600 pairs of DCCOs is based on a "survival gap" analysis completed by NOAA Fisheries that relies on 3 essential datasets: estimates of smolt consumption, estimates of cormorant population, and estimates of smolt population sizes. To have confidence in these estimates, each needs to be based on robust methods, but from what is presented in the DEIS (Appendix D), many of them clearly are not. Therefore, the population target for cormorants is based on an analysis that is not scientifically rigorous enough to inspire confidence and clearly demonstrate that the chosen population target is appropriate. Some issues:

Smolt abundance. The estimates of smolt abundance rely on "memos" that can't be readily accessed for review. Additionally, the original purpose of the estimates recorded in the memos are for use by NOAA's permit office on proposed actions that would occur in a given upcoming year. As such, the estimates are predictions, and generally not verified afterwards using any empirical measurements. The

actual data collected are relatively sparse and many of the component estimates are little more than back of the envelope calculations…in some cases little more than educated guesses. So we have the following combination of problems: estimates based on a very data-sparse foundation; methodology that is not readily accessible, nor independently peer-reviewed (never published in a journal or even a peer-reviewed technical memo); no attempt to understand or quantify the uncertainty/error associated with the estimates; no empirical measurements to assess the accuracy of the estimates; and estimates generated for a very different purpose than their use in the DEIS. Considering the scale of lethal culling and population reduction that the DEIS proposes, using imprecise, uncertain estimates like this to quantify the management objective is unacceptable.

Estimates of smolt consumption. The "survival gap" analysis was conducted at the species level for steelhead and sockeye salmon, and for a particular age-class of Chinook salmon. However, estimates of predation rates are available at the level of the conservation units listed under the ESA, ostensibly the reason for considering management of DCCOs. I am referring here specifically to NOAA Fisheries' data on smolt PIT tag recoveries collected at the DCCO colony on East Sand Island. These data measure stock-specific predation impacts, and the estimates have greater precision and specificity to the conservation units of interest, estimate uncertainty, and take into account possible variation in predation rates due to rearing and migration history. It is not clear why these data, acknowledged repeatedly in the DEIS, were not used in developing the cormorant management objective. Furthermore, the DEIS states on p. 32, Chapter 4, "This EIS adopts NOAA Fisheries analysis (see Chapter 1, section 1.2) and associated survival gap estimates, but proposes to use PIT tag recoveries in the future to evaluate management actions. PIT tags provide ESU or DPS specific estimation of predation rate, consistent with NOAA Fisheries (2014) directive to obtain stock-specific data when possible. Predation rates on ESA-listed Columbia River Basin ESUs or DPSs, using PIT tag recoveries on the East Sand Island DCCO colony over the last ten years, are provided in Chapter 3, section 3.2.5 and Appendix C." This acknowledges that the PIT tag data are available and are more appropriate for the analysis. Thus, in this regard, the best science available was not used in NOAA Fisheries' survival gap analysis.

Variability in cormorant diet. Research by Lyons et al. (2014) to evaluate potential benefits to salmon recovery from different DCCO management scenarios demonstrated that the annual consumption of juvenile salmonids by DCCOs varied widely from year-to-year. For instance, in 2005 DCCOs consumed about 2 million salmonid smolts, while in 2011 they consumed 20 million. These vastly different consumption rates occurred when cormorant numbers were quite similar, indicating that factors other than just cormorant numbers influence consumption rate. Therefore, reductions in cormorant numbers may not lead to the presumed benefits expected when an average consumption rate of 11 million salmonids is presumed. Moreover, lower levels of predation that are acceptable to NOAA may occur without reductions in colony size. The analysis does not take into account either of these possibilities.

Extrapolation to base period and estimated predation rate. The analysis also extrapolates data collected during 1998-2012 to the period from 1980 to 1997 to determine rates of salmonid consumption (and abundance). But the data presented in the DEIS (as noted above) demonstrate that very large inter-annual variation in cormorant consumption rates of salmonid smolts characterize cormorant diets. This great variation makes it impossible to determine how close the extrapolation to the earlier period comes to reality. Since this extrapolation is very important in defining the management objective for DCCOs, it is critical to have greater confidence in this information. The increase in DCCO predation from the base period to the current period is used to define the necessary DCCO reduction to return to a lower predation rate, but there is no way to interpret the biological relevance represented by this level of reduction in DCCO predation. This is another weak aspect of the analysis.

Compensatory mortality and uncertainty. The analysis dismisses the importance of compensatory predation mortality by arguing that the extent to which it may occur doesn't influence the management objective to return to a prior level of predation. However, potential benefits arising from cormorant management do not necessarily equal potential benefits arising from management to reduce mortality due to other factors (e.g., at a dam), despite similar smolt mortality rates, due to likely differences in the proportion of mortality that is compensatory. The DEIS points out that smolt mortality caused by cormorant predation is generally comparable to the mortality induced by one mainstem dam. While that may be true, smolt mortality due to cormorant predation is more often focused on less fit fish compared to mortality at dams (e.g., turbine passage), which likely affects all fish regardless of their condition. Due to these differences in the extent of compensatory mortality between predation and dam passage, the benefit of cormorant management is not appropriately assessed in the context of other recovery actions. Furthermore, the DEIS states on p. 33-34 (Chapter 4) that even once colony size is reduced to targeted levels, "smaller increases in juvenile salmonid survival than are presented in Tables 4-2 and 4-3 could occur, depending on the actual degree to which DCCOs greater than the target colony size can be completely excluded from the estuary and to the degree mortality is compensatory (see Chapter 4, section 4.6.5 for more discussion)." This clearly acknowledges the fact that reductions in cormorant colony size may not directly correlate with targeted increases in salmonid survival rates, due at least in part to unpredictable levels of compensation. In section 4.6.5 the DEIS discusses the issue of compensatory mortality and uncertainty, and states "the purpose and need of this EIS is to reduce depredation damage caused by DCCO predation of juvenile salmonids, which is a well-studied and documented source of mortality. Constraining management due to unknown and speculative amounts of compensatory mortality would allow a known source of significant mortality of juvenile salmonids within the Columbia River Estuary to continue unaltered." While cormorant predation may be a well documented source of mortality, this statement does not diminish the importance of the fact that some portion of the mortality due to cormorants may be completely meaningless if it is replaced by some other mortality factor, and DCCO reduction does not ultimately lead to an increase in the number of adults that return to spawn. Therefore, I do not think this issue has been adequately addressed relative to salmon recovery and cormorant population size.

Relationship of cormorant predation on salmonid smolts to salmon recovery. The role of cormorant predation and the relationship of increasing survival of listed salmonid smolts in the estuary to numbers of adults returning to spawn is not addressed. However, returns of adult salmon and a self-sustaining population are the ultimate measure of salmon recovery. Some evidence that reducing cormorant predation on smolts is going to lead to significantly increased salmon recovery should be presented. At the very least the relationship of smolt survival to returning adults should be explored in more detail, so that the role of cormorant predation can be understood in a broader context. If these fish experience high mortality in the marine phase of their lifecycle, to what degree is reducing cormorant predation in the estuary going to contribute to the number of adult salmon returning? For instance, on p. 3-41, the DEIS reports "that subyearling [Lower Columbia River] Chinook are particularly vulnerable to cormorant predation, with average annual consumption estimates of 7.8 million (range = 1.9-15.6) subyearling Chinook during 2004-2013." On the same page the DEIS also states that "between 50 and 100 million [Chinook] subyearlings [have been] released annually into the Lower Columbia River Basin since the 1990s (NOAA 2011a)." Yet, on p. 3-39, the DEIS states that in the Columbia River Basin, many populations of salmonids "have been declining since the late nineteenth century, with documented losses to harvest, habitat degradation, hydropower development, and other anthropogenic causes (Gresh et al. 2000; Lichatowich 2001; NOAA 2014a)…. Before industrialized development occurred, numbers of adult salmon in the Columbia River Basin were estimated to be around 10 to 16 million adult

fish per year (Gresh et al. 2000). Currently, less than two million adult salmon return to the Columbia River Basin annually (FPC 2014)." If only two million adults salmon are returning to the basin annually, what else is happening to all the other tens of millions of fish that are apparently present (due to a combination of hatchery releases and natural reproduction) that so few make it back? Of the fish avoiding cormorant predation in the estuary, how many survive only to be consumed later by other predators in the ocean? To what extent does the mortality that occurs there diminish benefits of reducing cormorant consumption of smolts in the estuary? This is a big picture question fundamental to the whole effort, and nothing presented in this DEIS has demonstrated that killing cormorants in the estuary is going to ultimately result in substantial increases in the numbers of adult salmon returning to spawn.

Conclusion for #1. While there may be a need to limit DCCO predation on ESA-listed salmonid species, NOAA Fisheries' "survival gap" analysis does not demonstrate that the cormorant population needs to be limited to the extent the analysis proposes. Rather, the presumed level of improvement to salmonid survival rates from proposed reductions to cormorant numbers is highly questionable. Notably, the survival gap analysis has not been peer-reviewed, nor did it utilize scientific information provided by Lyons et al. (2014) on potential benefits to salmonid recovery expected from reducing the numbers of breeding DCCOs in the estuary. I believe that submitting this analysis to a more rigorous evaluation by a panel of objective experts would highlight the flaws described above, and would substantiate that the best available science was not used to arrive at the DCCO population objective. This is a serious oversight, as the decision to reduce the population size by two-thirds will affect tens of thousands of birds and has the potential to negatively impact the entire western DCCO population. A proposal to eliminate cormorants to this magnitude should warrant a much more formal and rigorous analysis than what appears to have been done in these Excel spreadsheet calculations, and one that is supported by the peer review process. Moreover, the extent to which reducing cormorant predation on smolts will contribute to salmon recovery as measured by adult salmon returns remains unaddressed, and ultimately may be minimal if salmon spared from cormorant predation ultimately experience higher mortality rates once they leave the estuary. Finally, in a broader context, one of the important conclusions from my book (Wires 2014) is that most cormorant management either is not science-based, is based on poor-quality science, or is contrary to what scientific studies indicate. Based on my observations and concerns described above, the same conclusion is emerging for the management alternative advocated by the USACE in the DEIS.

2. **Lethal activities to resolve conflicts.** The USFWS is tasked not only with managing migratory birds, but also protecting them. To this end, relative to issuing depredation permits, the agency clearly states on its website: "You DO need to demonstrate substantial non-lethal methods such as harassing/hazing, exclusions, habitat management, and cultural practices prior to applying for a permit (http://www.fws.gov/pacific/migratorybirds/Permits/dprd.html)." In recognition of this requirement, the DEIS indicates that nonlethal approaches have been employed to try to resolve conflicts with cormorants over ESA-listed salmonids. The Corps argues these methods failed, and therefore a more aggressive lethal approach is advocated. However, after reviewing what has actually been done in this regard and engaging in discussions with USGS researchers studying nonlethal approaches, I believe this statement misrepresents how and why nonlethal approaches have been employed to resolve the conflict in the Columbia River estuary. Therefore, I do not think the requirement that substantial nonlethal methods first be employed has been met. Moreover, I think nonlethal methods, if employed at the appropriate scale and intensity, are entirely feasible in reducing cormorant consumption of salmonid smolts in the Columbia River estuary. Several major points support this conclusion.

Habitat enhancement and social attraction studies. Work by Suzuki (2012) reports successful and encouraging results on habitat enhancement and social attraction techniques for relocating nesting DCCOs to alternative colony sites in the Columbia River estuary. But to be effective, these techniques should be employed at sites where cormorants have some previous history of nesting or roosting. In the Great Lakes region, research indicated the presence of other nesting colonial waterbirds was also very important in site colonization by DCCOs (Wires and Cuthbert 2010). Additionally, these attraction techniques must be accompanied by concurrent efforts to discourage nesting at nearby active colonies to provide incentive for cormorants to shift to the attraction site. These attraction sites may also need to be maintained to keep cormorants at a new site. In the cases that the DEIS mentioned where these techniques did not work, the requirements of previous use and incentive to leave nearby sites were either not met or the attraction methods were not maintained. Essentially, the design of the attraction and enhancement of cormorant colonies was done in an *experimental context* to test whether restoring colonies or attracting cormorants to different sites would be feasible, not in an actual *management context* with the goal to establish long-term colonies. Thus the portrayal of these methods as ineffective misrepresents the feasibility of the habitat enhancement and social attraction techniques, and creates the false impression that these methods had been employed to achieve management goals, when in fact these methods were only tried to investigate their potential.

Reducing available nesting habitat. The DEIS also indicates that cormorant nesting habitat was reduced on ESI, but despite these reductions cormorant numbers increased. Again, this is very misleading and is used to discredit the potential of Alternative B and to satisfy the requirements for a depredation permit. In fact, work by USGS researchers during 2011-2013 demonstrated that the area used as nesting habitat could be reduced to limit the size of the colony (Roby et al. 2012, 2013, 2014), all through nonlethal actions. But again, efforts to reduce available nesting habitat were not undertaken at a scale that would cause large numbers of DCCOs to emigrate from East Sand Island and reduce colony size. Reducing the area of nesting habitat on the island sufficient to reduce numbers of nesting DCCOs would require significant management actions, and thus an EIS. Therefore, the DEIS needs to distinguish between the application of nonlethal methods in the experimental and management contexts. These methods have not been tried in a management context….doing so would require a much larger scale effort that addresses multiple components as described above.

Dispersing birds to areas where other or potentially greater conflicts will occur. The DEIS expresses concern that if birds are dispersed from ESI they may cause problems elsewhere. First, birds may or may not move to areas where additional problems will occur. Second, if they do, research again indicates that they could easily be dissuaded from colonizing new sites where there is concern about potential impacts (Roby et al. 2012, 2013, 2014). In this regard, I point to management conducted in Denmark, where similar conflicts with fisheries occur due to Great Cormorants. Denmark has a long-term policy to manage cormorants through nonlethal means and to disperse them when they try to colonize new sites. This approach is also being used in several other European countries. To obtain more information on the Danish experience, I contacted a Danish colleague, Dr. Thomas Bregnballe, who has studied cormorants and been involved in managing them in Demark for decades. Dr. Bregnballe wrote that in Denmark, "The major philosophy is that the cormorants, as central place foragers, will tend to forage near to their colony, and therefore cormorant predation pressure on fish will decline with increasing distance from the colony. Therefore, hindering cormorants from founding new colonies near hitherto unexploited food resources will limit the birds in their access to food resources…We believe that this strategy has worked as intended in Denmark. The cost of this approach is, of course, that you need some manpower to be ready to disturb the birds as soon as they try to found a new colony (thus it is far easier to keep

cormorants off a hitherto un-colonized site if the birds are hazed in the earliest phases of breeding and before the birds have experienced that it is possible to breed with success at the site). Although Denmark has many small islets where cormorants could breed, they are generally rather slow in trying to colonize new sites into use as breeding colonies. So the task has not been that demanding in Denmark."

Dr. Bregnballe also commented on the application of this approach to the situation in the Columbia River estuary: "Concerning the specific situation in Oregon, I would guess that heavy disturbance early in the breeding season would 'provoke' many of the birds scared from the existing sites to start looking for suitable alternatives nearby, as well as more distant sites where they could found new colonies. There would also be birds that continue to try to return and breed at the site where they successfully bred in earlier years, so the scaring would have to be carried out during most of the season and in subsequent seasons. But my guess would also be that you could lower the number of cormorants foraging in the estuary if you ran a scaring programme in the existing colonies as well as at the nearby sites where birds try to form new colonies. Again the success of the scaring is likely to be highest if carried out in the very earliest phases of breeding – before egg-laying and if some manage to lay eggs then avoid that the birds are allowed to incubate for weeks. From an ethical point of view these actions are not very nice, but if the alternative is to shoot (and wound) large numbers of cormorants annually, then this would be a more 'humane' approach."

Some of this work is published in Danish, and there is one extended abstract in English. I have attached numerous citations at the end of this document to identify this work for your consideration (Bregnballe and Eskildsen 2002, 2009; Bregnballe et al. 2013). Contrary to the concern expressed in the DEIS, the success of the Danish experience suggests managing for the selection of DCCO nesting locations (and by extension, foraging locations) once DCCOs disperse from ESI is quite feasible. For a smaller-scale and more local example, I also point to the management program that was developed for Oneida Lake in New York State. This program successfully limited cormorant nesting and foraging by migrant birds mostly through an intensive hazing program and other nonlethal methods (see Coleman 2009 and DeBruyne et al. 2013 for management history). Again, such work demonstrates that a hazing program and a nonlethal approach can be very effective management strategies for cormorants.

Conclusion for #2. The USFWS is a cooperating partner on this DEIS and is faced with an enormous challenge relative to issuing a depredation permit that would allow the removal of such a large number of birds and such a significant percentage of the western population. East of the Mississippi the establishment of the depredation orders has resulted in a 19th century approach to cormorant management: A pattern of destroying cormorants in huge numbers once again prevails. Since the depredation orders were established, more than half a million cormorants have been killed and hundreds of thousands of nests destroyed. In the Great Lakes, where most of the breeding birds targeted have been destroyed, cormorants have a diet that consists largely of round goby, an invasive species, and there is very little scientific evidence that this management is necessary or benefits valuable fisheries (Wires 2014). But the model of killing as the approach to cormorant management has become entrenched, and a pattern is now established….this is just what we do with cormorants, especially relative to fisheries with a long history of poor management…despite the irrationality and ethical concerns that underlie this approach. We now destroy birds at NWRs, Federal Wilderness Areas and the moment they fly off of privately owned islands bought by NGOs for their protection (Wires 2014). The USFWS should consider that by issuing a depredation permit in support of Alternative C, it is opening the door for establishing a similar pattern of destruction west of the Mississippi. In so doing it is not upholding its responsibilities to protect these birds, which so greatly need protection given the level

of hatred and misunderstanding that surrounds them. The fact that the nonlethal methods that have been employed to reduce cormorant predation on salmonid smolts can be easily challenged as legitimate efforts to resolve this problem should make the USFWS pause and consider more carefully the application of nonlethal techniques in a management context before killing large numbers of birds. There is a team of experts right at the agency's fingertips…the USGS research team led by Dan Roby at OSU… that could help with the design and implementation of these techniques. The agency must contemplate just what it will be getting into and the precedent it will set if it migrates the pattern of cormorant killing from East to West. Essentially, the agency is at a crossroads: It can perpetuate the negative image that cormorants have, the belief that they need to be killed, and lock in this approach as not just an eastern policy but a national one, or it can show some leadership and establish a new pattern for resolving conflicts with fish-eating birds, conflicts that have resulted from the mismanagement and degradation of fisheries due to human actions.

3. **Numbers of birds that would be removed.** Alternative C indicates that killing ~ 16,000 birds would reach the cormorant population target by 2018. Based on several factors, however, I think this number has not been realistically considered or accurately calculated.

ESI DCCO population assumed to be at carrying capacity. The population model presented for cormorants (Appendix E-2) assumes the ESI colony is at carrying capacity, but the fact that a large increase occurred in 2013 discredits this assumption. If the colony is not at carrying capacity, losses due to killing birds may to some extent be offset by recruitment and immigration. This means more birds (possibly many thousands more) will have to killed above the 16,000 proposed.

Experience with lethal operations in the East indicates much greater levels of destruction must be employed than just the difference between current and targeted colony size. There are several clear examples from the Great Lakes basin indicating that the number of birds killed that was necessary to reach and maintain population targets greatly exceeded the difference between starting and target population sizes. Some examples: In Michigan, control was initiated in 2004 when the state population size was ~ 30,000 pairs. To reduce numbers, combined strategies of culling and egg oiling were employed. During 2004 - 2010, ~ 42,000 birds were killed and somewhere between 35,000 – 75,000 individual nests were oiled. These actions resulted in a reduction of only about 10,000 pairs in the state as of 2011 (USFWS 2014; Cuthbert and Wires, unpubl. data, Great Lakes biennial cormorant monitoring). Current population size is not yet available, but in 2011 and 2012 another 19,000 birds were killed under the Public Resource Depredation Order, bringing the total birds killed in Michigan under this order during 2004 – 2012 to 61,091 (USFWS 2014). Thousands of nests were also oiled. More birds were killed in 2013 and 2014 (and more nests destroyed), but these numbers are not yet available. In Minnesota, lethal control was initiated at Leech Lake in 2005 to reduce this colony by 80% from ~ 2,500 pairs to 500 pairs (USDA 2005). To reach and maintain this target size, close to 20,000 birds were killed during 2005-2012 (USFWS 2014). In Ohio, lethal control was initiated in 2006 at West Sister Island to reduce this colony from 3,800 pairs to 1,500-2,000 pairs (USDA 2006). During 2006-2012, more than 10,000 cormorants were killed at this one location (D. Sherman, pers. comm.); again, more cormorants were killed in 2013-2014, but the data are not yet available. See also examples from Canada, summarized in Wires (2014); these examples include High Bluff Island, ON; Middle Island, ON; and Lac La Biche, AB). These examples provide ample evidence that (1) reaching and maintaining target population sizes involves killing and managing much larger numbers of cormorants than is implied by subtracting the population objective from current population size and (2) initiation of this type of activity results in long-term and repeated culling programs to maintain objectives.

Risk to western North American population. Reducing the cormorant population through lethal means by the magnitude proposed has implications for the entire western North American population of DCCOs. The ESI colony constitutes more than 40% of the western population (Roby et al. 2014). The DEIS implies that this reduction will not negatively impact the population because the western population was sustainable at 1990 levels (p. 14). However, it is not clear that the population was sustainable at 1990 levels (particularly since the population has been in a recovery mode during most of the 20th and 21st centuries). In fact, a review that examined the status of DCCOs in western North America (Carter et al. 1995) documented various conservation problems that existed for DCCOs in the 1990s. This paper indicated that while cormorants were recovering in this region from losses experienced in the 19th century, local declines were still occurring due to habitat loss, pollution, human disturbance, and predators. Moreover, Carter et al. (1995) indicated that increases in numbers of nesting cormorants in the Columbia River Estuary coincided with declines in British Columbia, Washington, and locations in interior Oregon. Thus it is not clear that the 1990s population was sustainable, at least not without a large and productive colony on East Sand Island. Furthermore, since the 1990s, declines have occurred at both coastal and other inland regions have occurred (Adkins et al. 2014; W.D. Shuford, pers. comm.), and these are not considered in the DEIS. Therefore, it is not at all apparent that the elimination of 16,000 birds from the most productive colony in western North America (Adkins et al. 2014) will not be detrimental to the western population.

Conclusion for # 3. More birds will likely be killed than predicted, which should be taken into account when considering the magnitude of impact to the cormorant population. Furthermore, the western population is not at all comparable in terms of abundance to the eastern population; therefore, comparable levels of take as occur in the East (proposed on p. 12 of the DEIS) should not be considered sustainable. The DEIS has understated both how many birds will need to be taken and the risk to the western population from a cull of such magnitude.

4) **Impacts to other birds, humane issues and ethical considerations.**

Impacts to other birds. The DEIS acknowledges that under Alternative C there is a "…high potential for a substantial reduction in the size of the Brandt's Cormorant colony on East Sand Island…low to moderate potential for a substantial reduction in colony size of other species…" and that the breeding population of Pelagic Cormorants in the Columbia River Estuary could be reduced by as much as 20 percent as incidental take (p. 19). As noted above, I have visited this colony and nesting Brandt's cormorants are closely inter-mixed with nesting DCCOs. I think it will be impossible to avoid accidentally shooting many Brandt's cormorants while shooting up to 16,000 DCCOs. The DEIS does not address the potential biological impacts to these other bird species through potential reductions in their numbers through incidental take. Instead, Alternative C simply includes these species, along with DCCOs, as casualties of the mismanaged Columbia River ecosystem. I strongly urge the agencies to consider that incidental take could be avoided through nonlethal techniques. Avoiding impacts to other species should be a priority, especially given that that Brandt's and Pelagic cormorants are not implicated in salmonid declines and are not abundant.

Conversely, the concern about potential impacts to Streaked Horned Larks from dispersing cormorants (expressed repeatedly in the DEIS and used to justify the need for lethal control of cormorants at East Sand Island) appears unwarranted. Streaked Horned Larks use different habitat than cormorants, selecting sparsely vegetated areas rather than areas with trees, rocks, or artificial structures that are preferred by cormorants.

Humane issues. On pages 21-24 the logistics of culling are described, and there is absolutely no mention of the potential for humane issues to arise or contingencies to deal with wounded birds. Experience in the eastern U.S. with cormorant culling operations indicates that humane issues arise even under the best of circumstances (see summary in Wires 2014). Even with experienced sharp shooters, such as personnel with Wildlife Services, clean shots are not always made, and shooting from shotguns at birds in flight frequently results in birds being wounded, but not killed. Typically efforts are made to retrieve wounded birds and immediately euthanize them. This is not described as part of a contingency plan and I am not sure how this would happen on ESI without causing major and repeated disturbances. Further, if shooting takes place at night from blinds and tunnels, how will injured birds be handled? Again this is not described in the DEIS. Having visited the colony, I can't imagine injured birds could be easily retrieved in the dark. Trying to retrieve wounded cormorants during daylight would certainly cause enormous disturbance to nesting birds, which could lead to colony abandonment, as could walking through the colony picking up all the dead bodies. The fact that humane issues are not even mentioned in the document gives the impression that they either do not exist or, worse yet, that they are of no concern. The DEIS needs to acknowledge that shooting 16,000 birds is going to be a brutal activity with many birds experiencing some degree of suffering and trauma before death. The public needs to understand what shooting 16,000 wild birds really entails and have the option of commenting on whether or not these associated humane issues are acceptable.

Ethical consideration. In the development of cormorant policy for the Columbia River Basin, science is only part of the equation. The other key element is ethics, a less quantifiable but clearly recognizable consideration that should guide the decision-making process. Like science, ethics is a form of practical reasoning, and efforts to establish guidelines to govern behavior and decision-making have been recognized as formal disciplines. For example, the disciplines of bioethics and environmental ethics provide recognized forums for ethical issues and practical guidance for ethical decisions. As typical of cormorant management in the U.S., the USACE's DEIS is entirely devoid of any discussion of the ethical dimension of the decisions to be made for the Columbia River estuary. However, killing 16,000 DCCOs, and possibly many other birds, is inherently an ethical decision. In an important paper addressing the ethics of legal control for wildlife, Warburton and Norton (2009) suggest that all lethal control operations targeting nuisance wildlife should be first reviewed by an animal ethics committee. Researchers conducting trials that involve manipulations of animals at far smaller numbers are regularly subject to this evaluation. Thus, a management project at the scale of the one proposed for the Columbia River estuary certainly should be subject to rigorous ethical evaluation by a panel trained in this area, and one that represents *diverse* stakeholder views. To this end, I would like to note that there is precedent for the USFWS to bring in a trained ethicist to consider the ethical dimensions of culling wildlife, the ethics process and the need for moral review (see http://www.opb.org/radio/programs/thinkoutloud/segment/ethical-killing-barred-owls/). I encourage you to listen to the radio piece cited above and seriously consider that ethical reasoning is as integral to building strong environmental policy as is science.

Final comments / recommendations. For the numerous reasons stated above, I strongly urge the USACE and its cooperators to reconsider its Preferred Alternative, and go with a modified version of Alternative B. I say "modified" because I am not convinced that the population objective proposed for DCCOs in the Columbia River estuary is the correct one. I am also not sure what benefits, if any, reducing cormorant numbers will bring to salmon recovery efforts. Therefore, if measures must be taken to reduce cormorant consumption on salmonid smolts, I recommend this be done through nonlethal methods, which are entirely feasible. Concurrently, I suggest that a more rigorous analysis be undertaken to determine a more defensible population objective for cormorants. Finally, I recommend

consultation with a diverse group of stakeholders and the inclusion of a team of experts that can provide ethical guidance in the decision-making. Without these actions, DCCOs and potentially many other birds will just become additional casualties, along with the array of salmonids, of the mismanaged Columbia River ecosystem.

References

Adkins, J. Y., D. D. Roby, D. E. Lyons, K. N. Courtot, K. Collis, H. R. Carter, W. D. Shuford, and P. J. Capitolo. 2014. Recent population size, trends, and limiting factors for the double-crested cormorant in western North America. Journal of Wildlife Management 78:000-000; doi: 10.1002/jwmg.737

Bregnballe, T. & Eskildsen, J. 2009. Scale and effects of intervention measures in Danish cormorant colonies in Denmark 1994–2008. (Bregnballe, T. & Eskildsen, J. 2009. Forvaltende indgreb i danske skarvkolonier i Danmark 1994-2008. – Omfang og effekter af oliering af æg, bortskræmning og beskydning. Danmarks Miljøundersøgelser, Aarhus Universitet. 46 s. – Arbejdsrapport fra DMU nr. 249. http://www.dmu.dk/Pub/AR249.pdf

Bregnballe, T., Hyldgaard, A.M. & Therkildsen, O.R. 2013. Danmarks ynglebestand af skarver i 2013. Aarhus Universitet, DCE – Nationalt Center for Miljø og Energi, 30 s. - Teknisk rapport fra DCE - Nationalt Center for Miljø og Energi nr. 26 http://dce2.au.dk/pub/TR26.pdf

Bregnballe, T. & Eskildsen, J. 2002: Menneskelige indgreb i danske skarvkolonier 1994-2001. Naturovervågning. - Danmarks Miljøundersøgelser. 65 s. -Arbejdsrapport fra DMU, nr. 162.

Carter, H. R., A. L. Sowls, M. S. Rodway, U. W. Wilson, R. W. Lowe, G. J. McChesney, F. Gress, and D. W. Anderson. 1995. Population size, trends, and conservation problems of the double-crested cormorant on the Pacific coast of North America. Colonial Waterbirds 18:189–215.

Coleman, J. T. H. 2009. Diving behavior, predator-prey dynamics, and management efficacy of double-crested cormorants in New York State. PhD diss., Cornell University.

DeBruyne, R. L., J. T. H. Coleman, J.R. Jackson, L. G. Rudstam and A. J. VanDeValk. 2013. Analysis of prey selection by double-crested cormorants: A 15-year diet study in Oneida Lake, New York. Transactions of the American Fisheries Society 142: 430–446.

FPC (Fish Passage Center). 2014. Fish Passage Center Adult Passage Date. Available on-line at www.fpc.org.

Gresh, T., J. A. Lichatowich, and P. Schoonmaker. 2000. An estimation of historic and current levels of salmon production in the Northeast Pacific ecosystem: Evidence of a nutrient deficit in the freshwater systems of the Pacific Northwest. Fisheries 25:15-21.

Lichatowich, J. 2001. Salmon without rivers: A history of the Pacific salmon crisis. Island Press, Washington, D.C. 317 pp.

Lyons, D.E., D.D. Roby, A.F. Evans, N.J. Hostetter, K. Collis, and S.H. Sebring. 2014. Benefits to Columbia River anadromous salmonids from potential reductions in predation by double-crested

cormorants nesting at the East Sand Island colony. Final Report to the U.S. Army Corps of Engineers – Portland District. U.S. Army Corps of Engineers, Portland, OR. 50 pp. (Available through internet: www.birdresearchnw.org)

NOAA (NOAA Fisheries). 2011a. 5-Year Salmon and Steelhead ESA Status Reviews. National Marine Fisheries Service, Northwest Region. Portland, Oregon. Available at: http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/salmon_steelhead_esa_status_reviews.html.

NOAA (NOAA Fisheries). 2014. Supplemental Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(I)(A) Permit for Juvenile Fish Transportation Program. National Marine Fisheries Service, Northwest Region 246 pp.

NOAA (NOAA Fisheries). 2014(a). Office of Protected Resources. Overview of Endangered Species Act Listed Marine and Anadromous Fish. Available at: http://www.nmfs.noaa.gov/pr/species/fish/.

Roby, D.D., K. Collis, D.E. Lyons, J.Y. Adkins, Y. Suzuki, P. Loschl, T. Lawes, K. Bixler, A. Peck-Richardson, E. Dykstra, J. Harm, W. Mashburn, J. Tennyson, N. Ventolini, A. Evans, B. Cramer, M. Hawbecker, N. Hostetter, R.D. Ledgerwood, and S. Sebring. 2012. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Final 2011 Annual Report to the Bonneville Power Administration and the U.S. Army Corps of Engineers, Portland, OR. 171 pp. (Available through internet: www.birdresearchnw.org)

Roby, D.D., K. Collis, D.E. Lyons, J.Y. Adkins, Y. Suzuki, P. Loschl, T. Lawes, K. Bixler, A. Peck-Richardson, A. Patterson, S. Collar, N. Banet, K. Dickson, G. Gasper, L. Kreiensieck, K. Atkins, L. Drizd, J. Tennyson, A. Mohoric, A. Evans, B. Cramer, M. Hawbecker, N. Hostetter, J. Zamon, and D. Kuligowski. 2013. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Final 2012 Annual Report to the Bonneville Power Administration and the U.S. Army Corps of Engineers, Portland, OR. 239 pp. (Available through internet: www.birdresearchnw.org)

Roby, D.D., K. Collis, D.E. Lyons, J.Y. Adkins, Y. Suzuki, P. Loschl, T. Lawes, K. Bixler, A. Peck-Richardson, A. Patterson, S. Collar, A. Piggott, H. Davis, J. Mannas, A. Laws, J. Mulligan, K. Young, P. Kostka, N. Banet, E. Schniedermeyer, A. Wilson, A. Mohoric, A. Evans, B. Cramer, M. Hawbecker, N. Hostetter, A. Turecek, J. Zamon, and D. Kuligowski. 2014. Research, monitoring, and evaluation of avian predation on salmonid smolts in the lower and mid-Columbia River. Draft 2013 Annual Report to the U.S. Army Corps of Engineers and the Bonneville Power Administration, Portland, OR. 237 pp. (Available through internet: www.birdresearchnw.org)

Suzuki, Y. 2012. Piscivorous colonial waterbirds in the Columbia River estuary: Demography, dietary contaminants, and management. Ph.D. dissertation in Wildlife Science, Oregon State University, Corvallis, OR. 183 pp.

U.S. Department of Agriculture, Wildlife Services. 2005. Final Environmental Assessment: Reducing Double-crested Cormorant damage in Minnesota. USDA-Animal and Plant Health Inspection Service-Wildlife Services, St. Paul, MN. 145 pages. *http://www.aphis.usda.gov/regulations/ws/ws_environmental_ minnesota.shtml*.

U.S. Department of Agriculture, Wildlife Services. 2006. Final Environmental Assessment: Reducing Double-crested Cormorant damage in Ohio. USDA-Animal and Plant Health Inspection Service-Wildlife Services, Reynoldsburg, OH. 161 pages. http://www.aphis.usda.gov/regulations/ws/ws_environmental_ohio.shtml.

U.S. Fish and Wildlife Service. 2014. Draft Environmental Assessment: Management of Double-Crested Cormorants Under 50 Cfr 21.47 And 21.48. Division of Migratory Bird Management *in cooperation with* USDA / APHIS / WS. March 2014.

Warburton, B., & B. G. Norton. 2009. Towards a knowledge-based ethic for lethal control of nuisance wildlife. Journal of Wildlife Management 73: 158-164.

Wires, L.R. and Cuthbert, F.J. 2010. Characteristics of double-crested cormorant colonies in the U.S. Great Lakes island landscape. Journal of Great Lakes Research 36: 232–241.

Wires, L. R. 2014. The Double-crested Cormorant, plight of a feathered pariah. Yale University Press, New Haven, Connecticut. 349 pp.